Overwater Structures Habitat Impacts

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Report to WDFW, WDOE and WSDOT. 2001

http://www.wa.gov/wdfw/hab/ahg/overwatr.htm

http://www.biomes.net

Impacts

- **Marine Fishes and Shellfish**
  - **life history strategies most closely associated with nearshore habitats**
- **Overwater structure effects to habitat controlling factors**
  - **light, wave energy, substrates, water quality**

Light Limitation Impacts

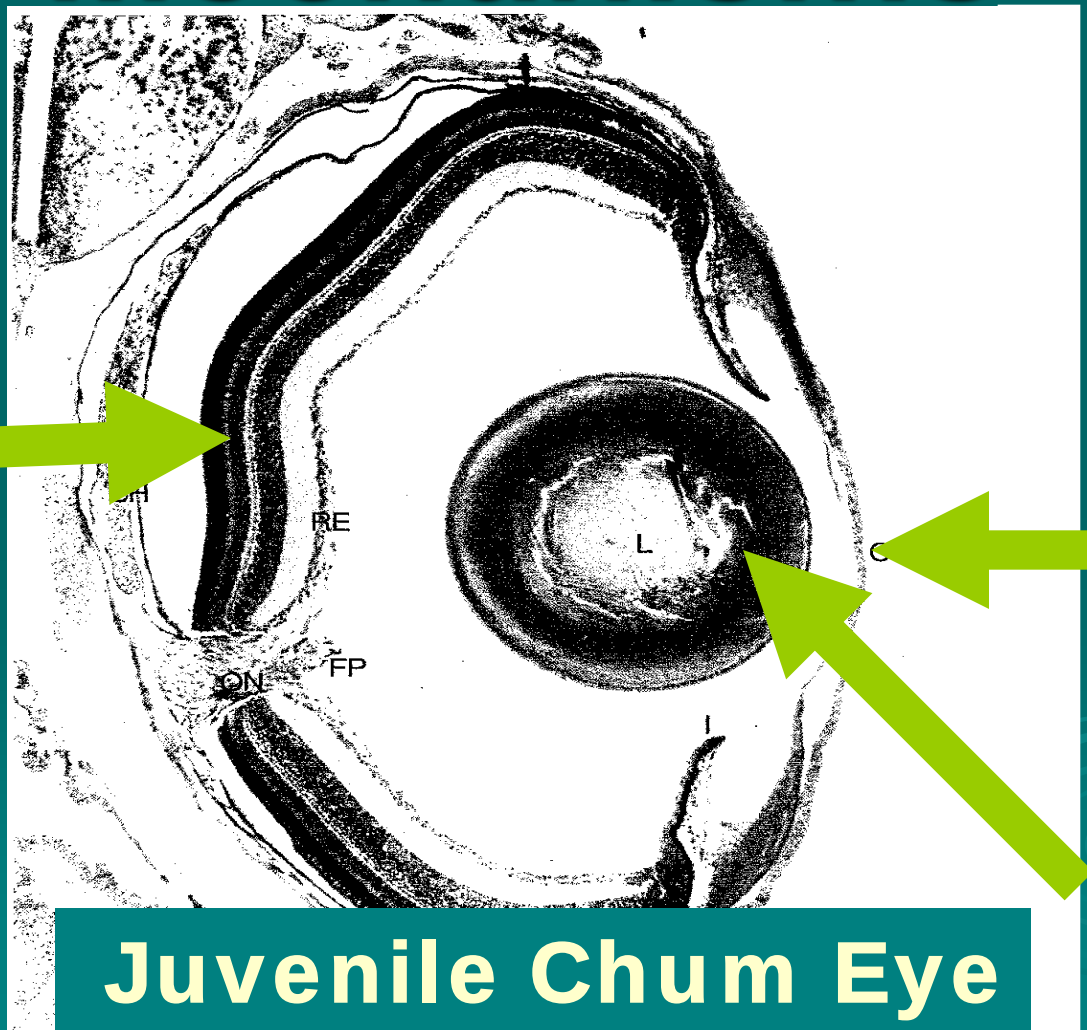
- Primary Production
- Abundance of Prey Resources
- Availability of Prey Resources
- Availability of Refugia (schooling, cover, avoidance)

Mechanism of Impact
Light Availability & Behavior

- What changes to ambient light patterns appear to affect the behavior of salmon fry?
  - Dark avoidance
  - Light attraction

- What are the physiologic mechanisms behind these effects?

Physiologic Mechanisms



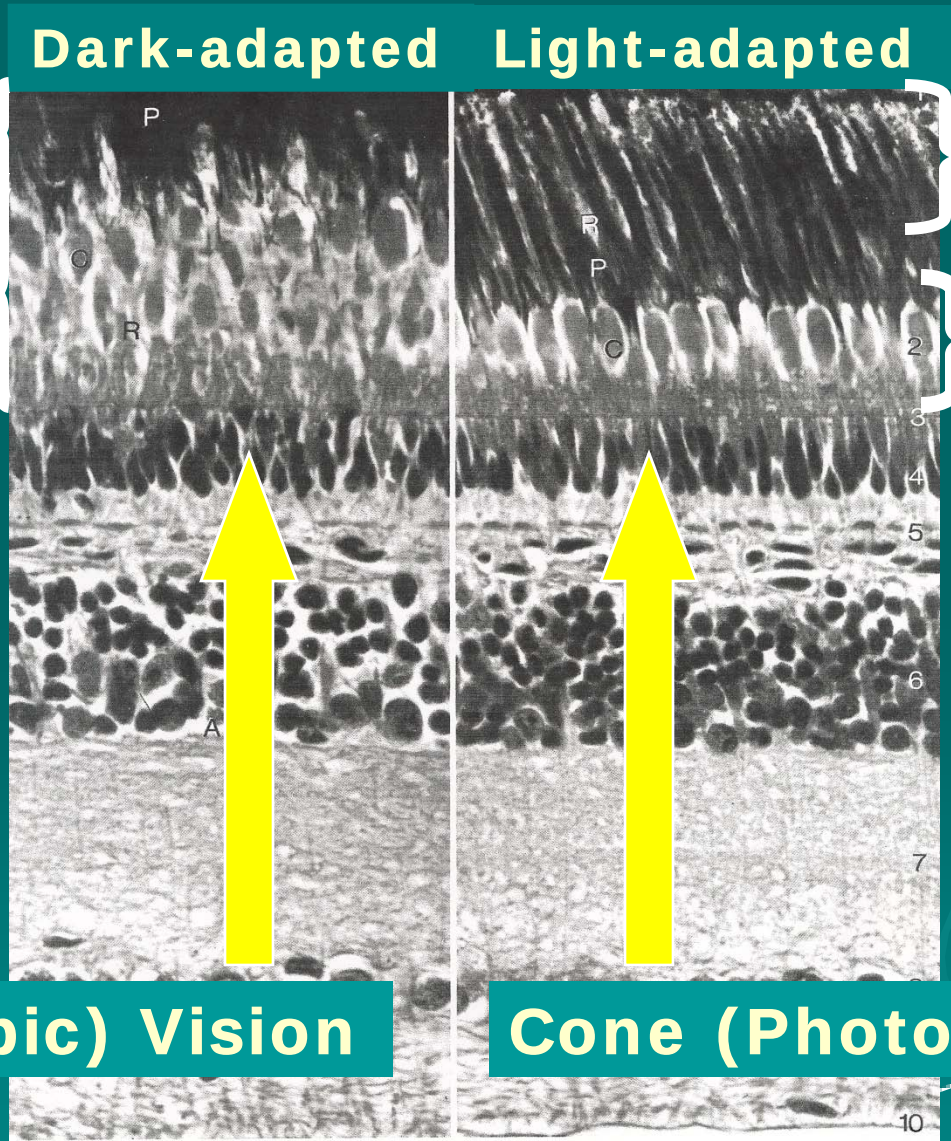
Retina

cornea

Lens

Juvenile Chum Eye

Retinal Cell Layers



Epilitheal layer

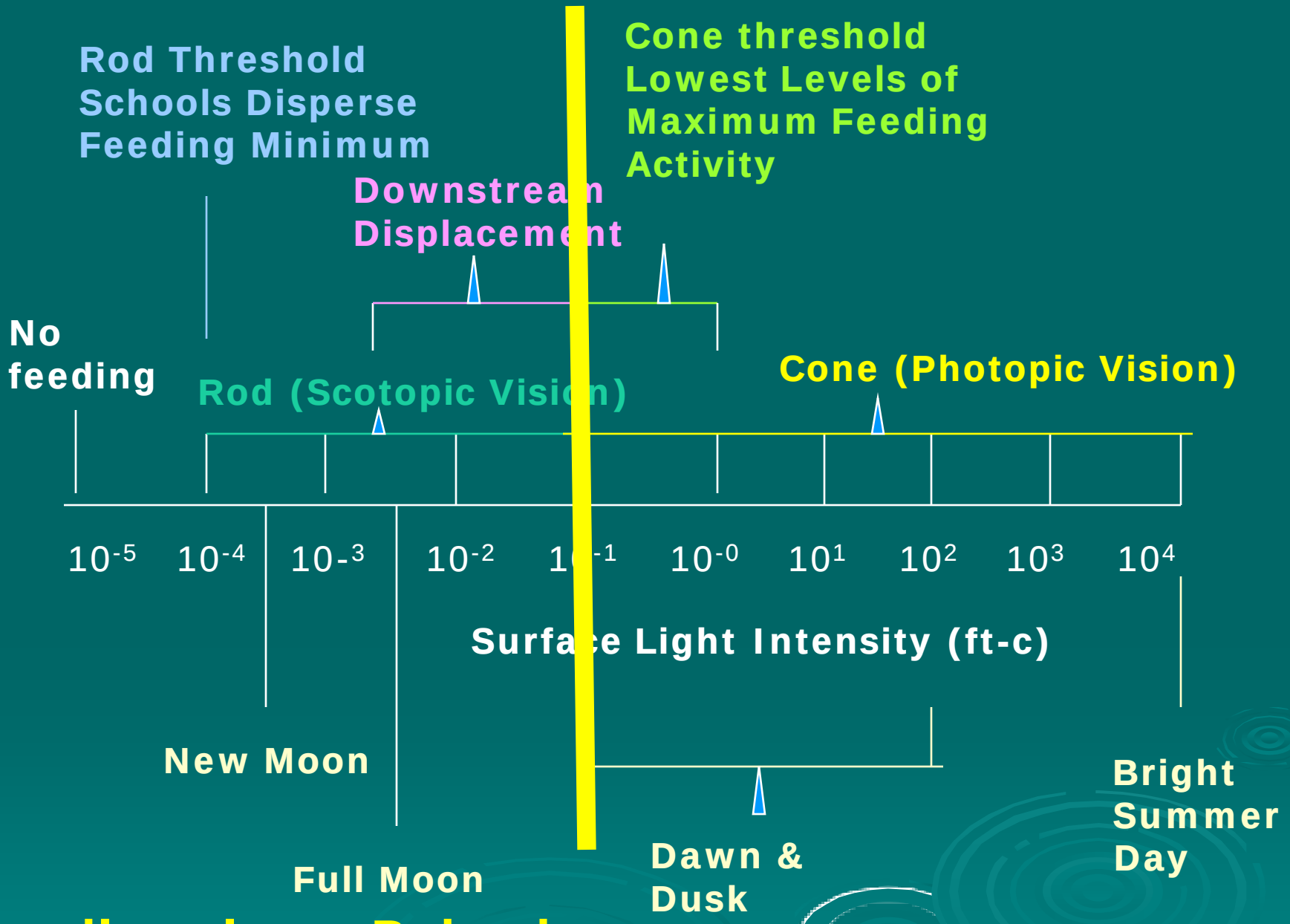
Rods & Cones

Epilitheal Layer

Rods & cones

Rod (Scotopic) Vision

Cone (Photopic) Vision



Juvenile salmon Behavior vs light levels (Ali 1959)

Docks

Light Limitation

- Migration (changing behavior)
- Predation (schooling, avoidance, cover)
- Prey Resource Availability
- Prey Resource Abundance

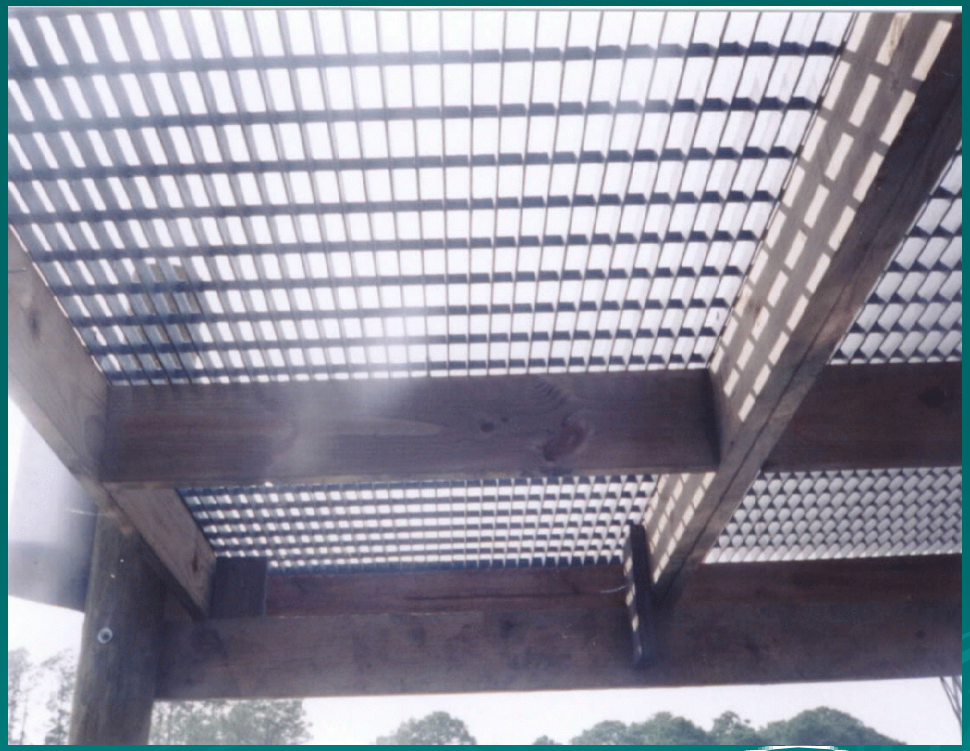
Substrate Changes

- Pilings - shellhash
- Piles change bottom bathymetry
- Pile-driving and prop scour re-arrange sediment distribution
- Floats as settlement sites for invasive species
- Grounding floats disturbing substrates and animal assemblages

Recommendations

- Increase dock height
- Decrease dock width
- North-south dock orientation
- Deep water dock placement
- Avoid prop scour (4-5 feet above MLLW)
- Glass inserts, gratings and reflective paint
- Under-pier artificial lighting in daylight hours (avoid artificial light at nighttime)
- Chain attachments from land – floats
- Dock removal during low use season – floats
- Decrease number of pilings
- Light reflective piling materials

Docks elevated 4-5 feet above mean sea level using the fiberglass grid for the entire dock surface allowed sufficient light penetration for continued sea grass survival under the conditions typical of St. Andrew Bay, Florida (Shafer and Robinson 2001).



City of Raymond

Community Dock Metal Grating

New York City Wall Street - Metal Grating

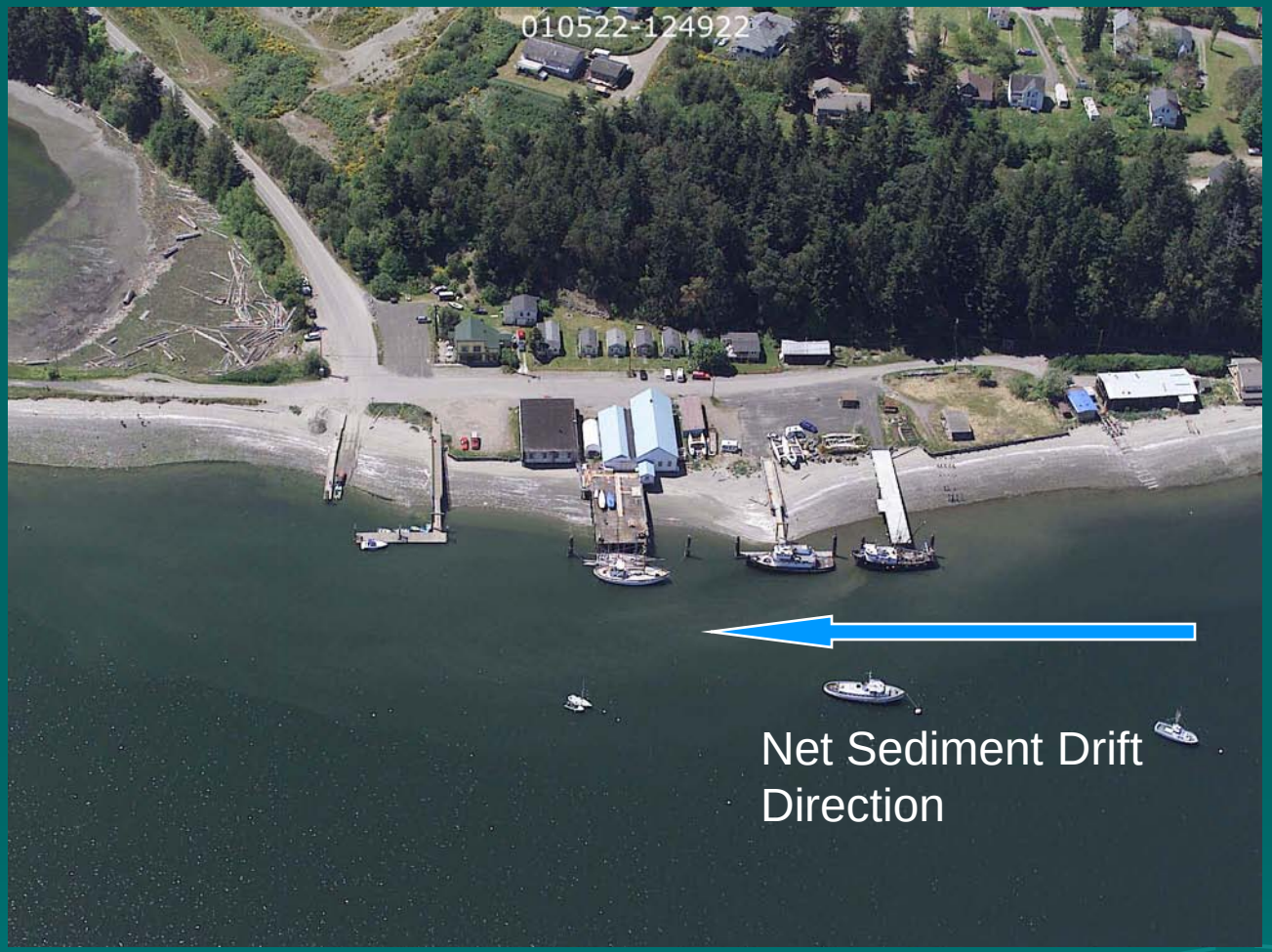
Clinton Ferry Terminal - Glass Blocks

Reflective Underbody + Grating

Port Townsend

Knowledge Gaps

- **Measurement of prey resource changes**
  - **Assemblage changes over time**
    - Types of resource losses
    - Abundance of resource losses
- **Measuring drift cell changes**
  - **Predicting change impacts**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Net Sediment Drift Direction

Solving for Scientific Uncertainties

- **Cumulative Effects Baseline Data**
  - **Modeling and Measuring Effects**
    - Identifying Scope
      - spatial scope
      - temporal scope
  - **Monitoring Criteria**
    - change magnitude over time
    - change significance over time

Planning for Coastal Development & Climate Change Pressures

- Commitment to a conservative precautionary approach to permitting and regulating docks, piers, ramps and floats
- Development of a landscape-level approach, based on specific landscape segments, to comprehensively plan for dock and pier regulations.
- Enactment of research agenda on topics of cumulative impacts of overwater structures and shoreline modifications